THE ORIGIN OF THE MAMMÆ.[1]—In this note, W. Haacke figures and describes the temporary marsupium of Echidna, and reasserts his claim to the priority of the discovery of the oviparity of the Monotremata. The conclusion is reached that the glands subserving a mammary function in these creatures are developed from sudoriparous glands, while in other mammals the mammary organs have been developed from sebaceous glands. Two apparently carefully-drawn figures of this pouch are given, which disappears after the single ovum is hatched. This pouch is not to be confounded with that described by Gegenbaur and Owen as occurring in this animal.

PHYSIOLOGY.[2]

DOES THE VOLUME OF A MUSCLE CHANGE DURING ITS CONTRACTION?—It has long been a disputed point whether or not the bulk of a muscle alters during its contraction. As far back as the middle of the seventeenth century it was the subject of investigation by Glisson, Borelli, Swammerdam and others, but their methods allowed of errors so great as to make their results nearly worthless. The first to observe by a fairly trustworthy method that the volume of a muscle is slightly lessened during contraction was Erman, about 1812.

Erman's method consisted in placing the muscle in a cylinder filled with water, and, during contraction of the muscle, observing the level of the water in a narrow capillary tube connected with the vessel. With every stimulation of the muscle Erman noted a slight fall of the fluid in the capillary. Some time after this, Johannes Müller suggested that the sinking of the level observed by Erman was caused, not by the diminution in bulk of the muscle itself, but by the compression of the air in the spaces between the fibres. Erman's experiments were thereupon repeated by Marchand and Ed. Weber who eliminated this possible source of error by killing the animals under water. Nevertheless they still observed a fall of the water in the capillary, precisely as Erman had done before them.

In more recent times Kühne has reinvestigated the question, and employed a new method, dependent on the change in specific gravity which must result from any change in volume. By this method Kühne reached negative conclusions, for he could observe no sinking of the araometer when the muscle attached to it was thrown into tetanus.

[1] Biolog. Centralblatt, VIII, No. 1, 1888, pp. 8–16.

[2] This Department is edited by Prof. Wm. T. Sedgwick, Mass. Inst. of Technology, Boston, to whom communications, books for review etc., should be sent.

On the other hand, Valentin, by the use of the balance, observed an increase in weight of about $\frac{1}{1370}$ during tetanus.

Other observers have obtained results quite as contradictory, and it seems almost as if every investigator came to conclusions differing from those reached by his immediate predecessors. All the while, however, the balance of evidence has appeared to be on the side of those who claimed that there was a slight decrease in the volume of the contracting muscle. Most of the recent text-books state it as probable that there is this minute diminution in volume.

There has recently been published an important paper on the subject by Professor J. R. Ewald,[1] who has repeated, as closely as possible, the experiments of Erman, Marchand, Weber and Valentin. Ewald regards Erman's method as by far the most delicate, if conducted in the right way and under favorable conditions. He then suggests that Erman and his successors have erred in some critical respects in the course of their experimental work.

Ewald accordingly altered Erman's method in the following manner: Into a glass flask two platinum wires are melted just above the base, so that they are diametrically opposite, and reach some millimetres down into the vessel. On the outside they form small hooks upon which can be hung the wires leading to an induction machine. The glass stopper of the flask is hollow and ends in a tube which is drawn out so as to be capillary.

The animal is killed under water, and the muscle without the nerve freed from the body. The flask, stopper and capillary tube are then filled with water, the muscle being first dropped to the bottom of the flask, where it rests on the two electrodes. The water in the capillary tube is lowered to a level favorable for observation, and a microscope fitted with a micrometer ocular is placed in a horizontal position, in order to observe the meniscus in the capillary. The time necessary for the adjustment of apparatus, etc., takes about three minutes, from the death of the frog to the pressing of the button for the stimulation of the muscle. Ewald then declares with emphasis: "*In none of the numerous experiments performed could I detect the slightest wavering of the level.*"

Ewald gives some striking examples of the sensitiveness of this method. If the palm of the hand is brought near the tube while the level is being observed through the microscope the water is seen to sink with great swiftness, owing to the expansion of the glass. A drop of ether evaporated on the glass produces the reverse effect —the meniscus rapidly rises. If the strength of the current be increased so that bubbles of gas begin to be formed on the electrodes, it will then be seen whether a very slight increase of volume in the interior of the flask will perceptibly change the posi-

[1] Archiv (Pflüger's) für die gesammte Physiologie (1887), Bd. xli., S. 215.

tion of the meniscus in the capillary. Ewald did this, and with a duration of the current so short that the bubbles on the electrodes became just visible, he saw the meniscus bound across the whole field of vision. By calculations based on the bore of the capillary and the magnifying power of the microscope, he found that a loss of a ten-thousandth of a cubic millimeter could not have escaped notice.

The author used also a second method, somewhat similar to that employed by Kühne, and obtained the same decisive negative result. He next repeated the experiments of Valentin, which were based on the use of a very delicate balance. Here, too, he states that, with proper precautions for securing the accuracy of the apparatus, there is in no case the slightest movement of the pointer.

Ewald then gives an extended account of his repetition of the experiments of Erman, Marchand and Weber. He suggests a very probable source of error in the failure of those observers to fix the stopper firmly into the vessel used in the experiments. When this and other details were attended to, he found that he could detect with the microscope no change in the level of the meniscus in the capillary tube.

Ewald, then, has repeated the experiments of preceding observers, has devised several new methods of greater delicacy than any heretofore used, and has arrived always at the same conclusion—*that in no case does a muscle change in volume during contraction.* Moreover, he has shown in addition that there exist very probable sources of error in the methods used by those investigators who have obtained positive results. Under such circumstances we can hardly refrain from considering the question as settled beyond reasonable doubt.—*E. O. Jordan* (*Boston*).

Organization of the American Physiological Society.—On the 30th of December last, about a score of the leading physiologists of the country met by appointment at the new College of Physicians and Surgeons in New York City, and proceeded to form an American physiological society. Dr. S. Weir Mitchell, of Philadelphia, was chosen temporary chairman, and Professor H. P. Bowditch, of Boston, clerk. A constitution was adopted and a formal meeting, the first of the American Physiological Society, followed. Officers were chosen as follows: *President*, H. P. Bowditch; *Secretary and Treasurer*, H. N. Martin, of Baltimore. These officers, together with Professors J. G. Curtis of New York, H. C. Wood of Philadelphia, and H. Sewall of Ann Arbor constitute the "Council" of the society. The constitution affirms that the society "is instituted to promote the advance of physiology, and to facilitate personal intercourse between American physiologists." The regular annual meetings are to be held, during the winter holidays,

at places fixed by the Council; and any resident of North America otherwise eligible (as described beyond) may be elected an Ordinary member. There were present, in fact, representatives from places as far apart as Montreal, Ann Arbor, Baltimore and Boston. The Institutions represented at the meeting included Harvard University, Yale University, Johns Hopkins University, The University of Pennsylvania, The University of Michigan, McGill University, The (Columbia) College of Physicians and Surgeons of New York, the Massachusetts Institute of Technology and the Medical Staff of the U. S. Navy.

The present members of the society are as follows: H. G. Beyer, U. S. Navy; H. P. Bowditch, Harvard University; H. C. Chapman, Philadelphia; R. H. Chittenden, Yale University; J. G. Curtis, New York; J. C. Dalton, New York; H. H. Donaldson, Baltimore; F. W. Ellis, Springfield, Mass.; G. L. Goodale, Harvard University; G. Stanley Hall, Baltimore; H. H. Hare, Philadelphia; W. H. Howell, Baltimore; Joseph Jastrow, Baltimore; W. P. Lombard, New York; H. N. Martin, Johns Hopkins University; T. W. Mills, Montreal; C. S. Minot, Harvard University; S. Weir Mitchell, Philadelphia; William Osler, Philadelphia; Isaac Ott, Easton, Pa.; E. T. Reichert, Philadelphia; W. T. Sedgwick, Boston; H. Sewall, Ann Arbor; R. Meade Smith, Philadelphia; V. C. Vaughan, Ann Arbor; J. W. Warren, Boston; William Welch, Baltimore; H. C. Wood, Philadelphia.

A Practical Definition of a Physiologist.—In the formation of any society it speedily becomes necessary to define its object and the qualifications requisite for membership in it. In the case of the new Physiological Society a general line of fitness was drawn (very wisely, as we believe) at investigation of some sort, as follows:—

"Any person who has conducted and published an original research . . . shall be eligible," etc.

Again, for practical purposes, "physiology" had to be defined; and it is very interesting to see that the physiology of to-day has so far advanced beyond the stage of merely "Human Physiology" that it was not deemed necessary to say at all that the physiology of plants (which the old system ignored) and that of the lower animals (which, for the most part, it disregarded) are genuine branches of the now broad and comprehensive science of the dynamics of living things. So, too, with experimental psychology. The time has gone by when physiologists need to explain that they welcome this as a vigorous and promising branch of physiology.

It appears, however, that with histology, pathology and experimental hygiene and therapeutics, the case is somewhat different; and the whole section relating to qualifications for membership read as follows:—

"Any person who has conducted and published an original research in Physiology or Histology (including Pathology and experimental Therapeutics and experimental research in Hygiene), or who has promoted and encouraged Physiological research, and who is a resident of North America, shall be eligible for elections as an ordinary member of the Society."

It will be observed that histologyoa subject almost purely morphological, is included (d oubtless frm its fundamental usefulness to the physiologist), while nothing is said of embryology, which, though largely physiological, has passed almost wholly into the hands of morphologists. The name "American," moreover, seems here better justified by the geographical limit adopted than is usual in the case of such organizations.

THE PLACE OF BACTERIOLOGY IN MODERN SCIENCE.—The preceding paragraphs may serve to show to which hemisphere of the great biological globe this new science belongs. For if bacteriology has a place anywhere, it is surely in experimental pathology and experimental hygiene.

Botanically speaking, bacteria are of no unusual interest on the morphological side. They are too small and too undifferentiated to yield great morphological harvests, at least with our present means of study. But from the physiological side they are just now without a parallel among living things, both in interest and in importance. The deeds which they do, the marvellous effects which they produce, are out of all proportion to their apparent anatomy. Some of the steps in the progress of this new physiological science will be hereafter noted in this department, and workers are cordially invited to send to its editor brief notes, or items of interesting news in bacteriology.

ARCHÆOLOGY AND ANTHROPOLOGY.[1]

At the late meeting of the Society of Anthropology, Washington, D. C., interesting papers were read,—one by Mr. H. M. Reynolds on the subject of Algonquin metal-smiths. The writer treated with care the important question whether the Indians were acquainted with the art of smelting copper. He argued that the working of the copper-mines of Lake Superior was not of such high antiquity as has been supposed, and may have been continued until comparatively modern Indian times. The other paper was by Mr. Jeremiah Curtin, on Moqui myths.

[1] This department is edited by Thomas Wilson, Esq., Smithsonian Institution, Washington, D. C.